



US009414795B2

(12) **United States Patent**
Nakata et al.

(10) **Patent No.:** **US 9,414,795 B2**
(45) **Date of Patent:** **Aug. 16, 2016**

(54) **RADIATION GENERATING APPARATUS AND
RADIATION IMAGING APPARATUS**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 66 days.

(21) Appl. No.: **14/483,018**

(22) Filed: **Sep. 10, 2014**

(65) **Prior Publication Data**

US 2015/0069256 A1 Mar. 12, 2015

(30) **Foreign Application Priority Data**

Sep. 12, 2013 (JP) 2013-189448

(51) **Int. Cl.**
A61B 6/00 (2006.01)

(52) **U.S. Cl.**
CPC **A61B 6/4405** (2013.01); **A61B 6/4411**
(2013.01); **A61B 6/4429** (2013.01)

(58) **Field of Classification Search**
CPC A61B 6/44; A61B 6/4405; A61B 6/4411;
A61B 6/4429; A61B 6/4435
USPC 378/62, 196–198
See application file for complete search history.

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(57) **ABSTRACT**

There are provided a radiation generating apparatus and a radiation imaging apparatus that have excellent transportability. The radiation generating apparatus and radiation imaging apparatus include a radiation generating unit configured to generate radiation, an arm configured to support the radiation generating unit, and a support pillar configured to support the arm and rotate the arm, wherein the support pillar has a housing portion that has a space for housing at least a part of the radiation generating unit.

12 Claims, 5 Drawing Sheets

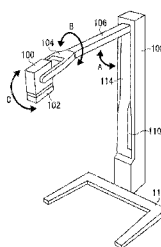


FIG. 1

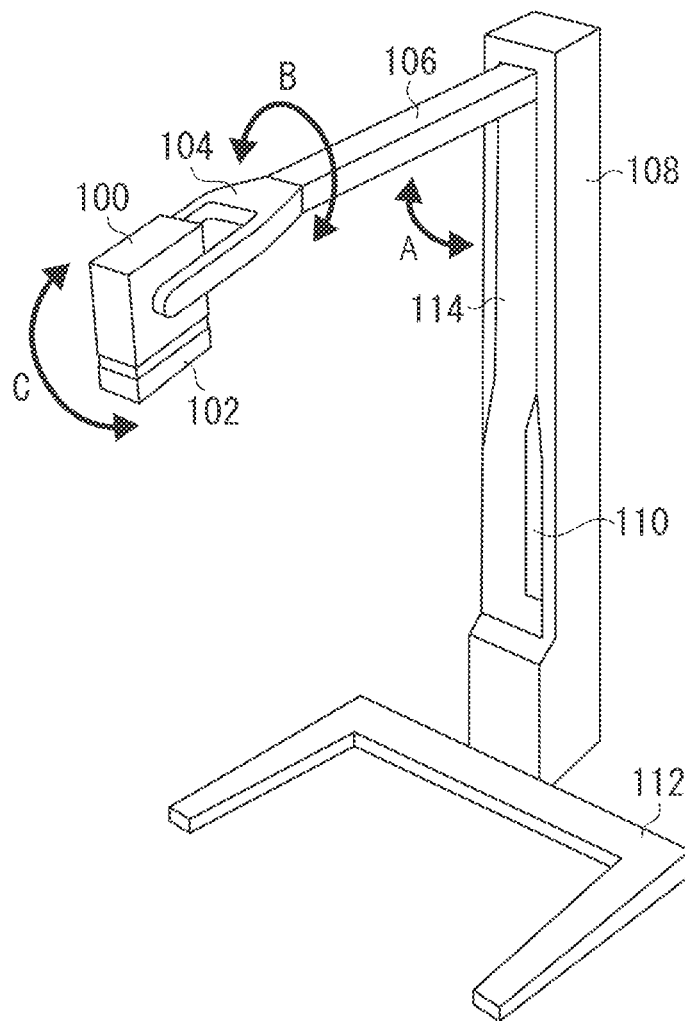


FIG. 2

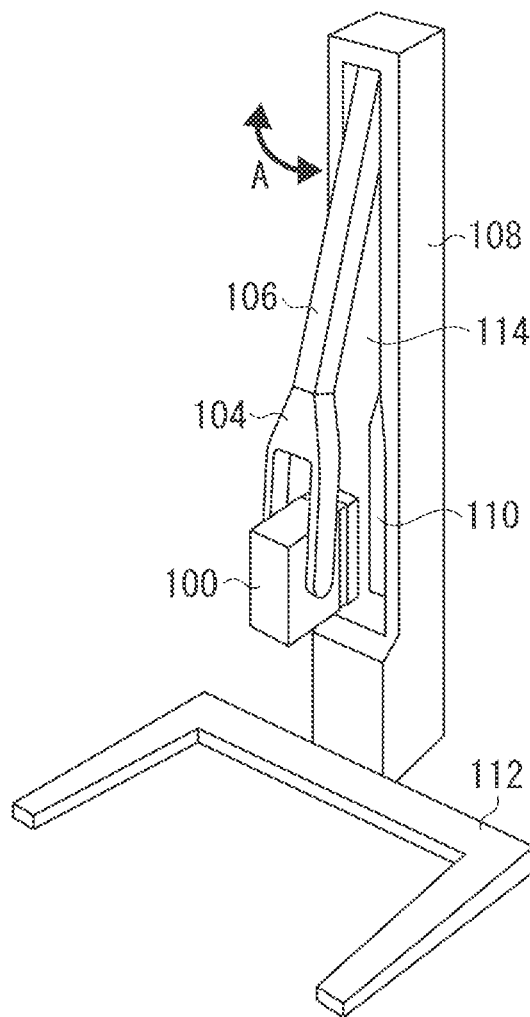


FIG. 3

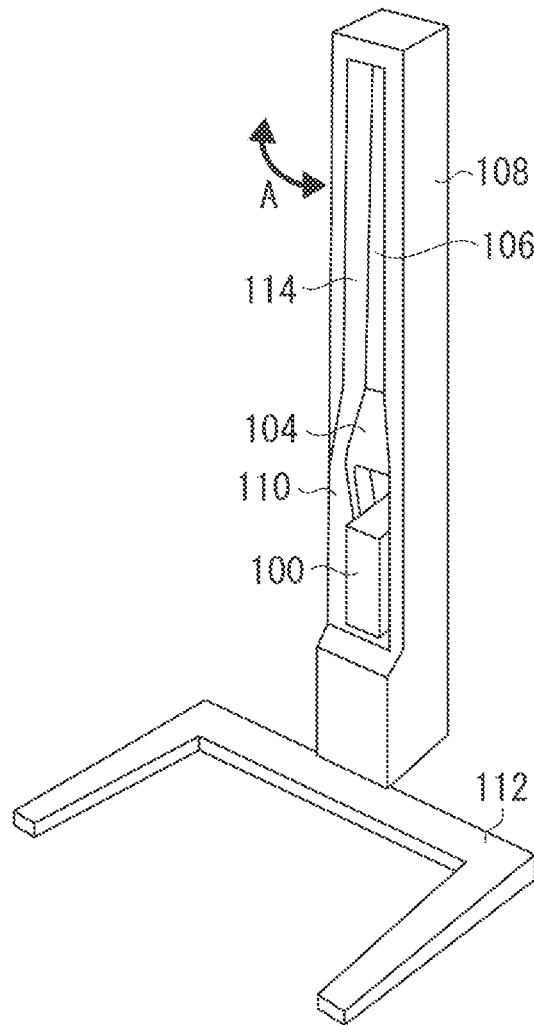


FIG. 4A

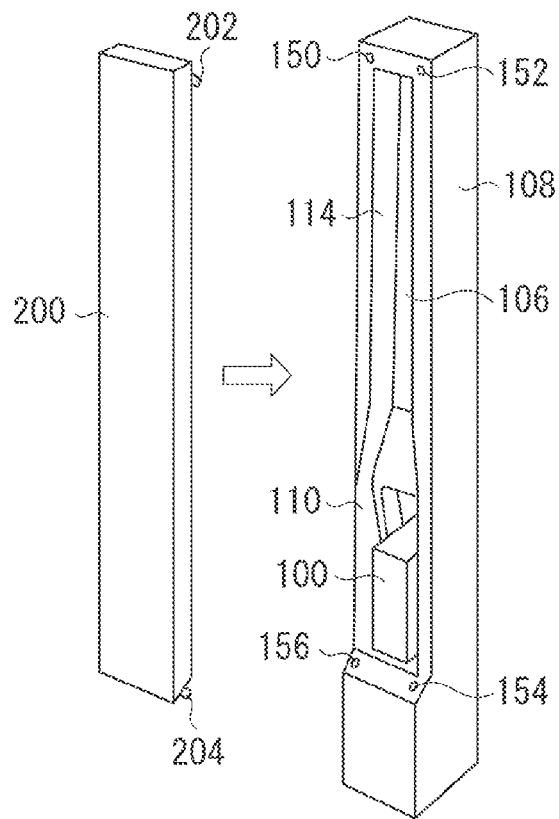


FIG. 4B

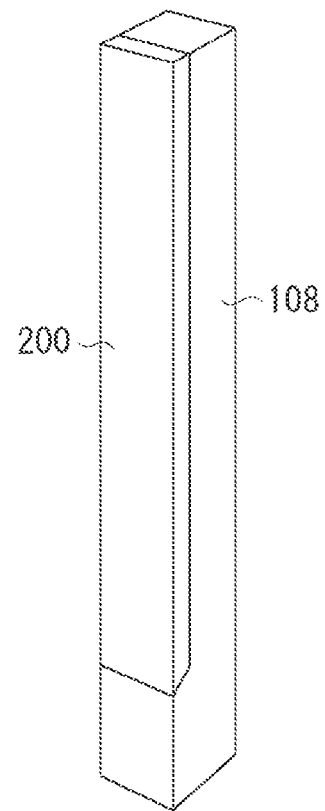
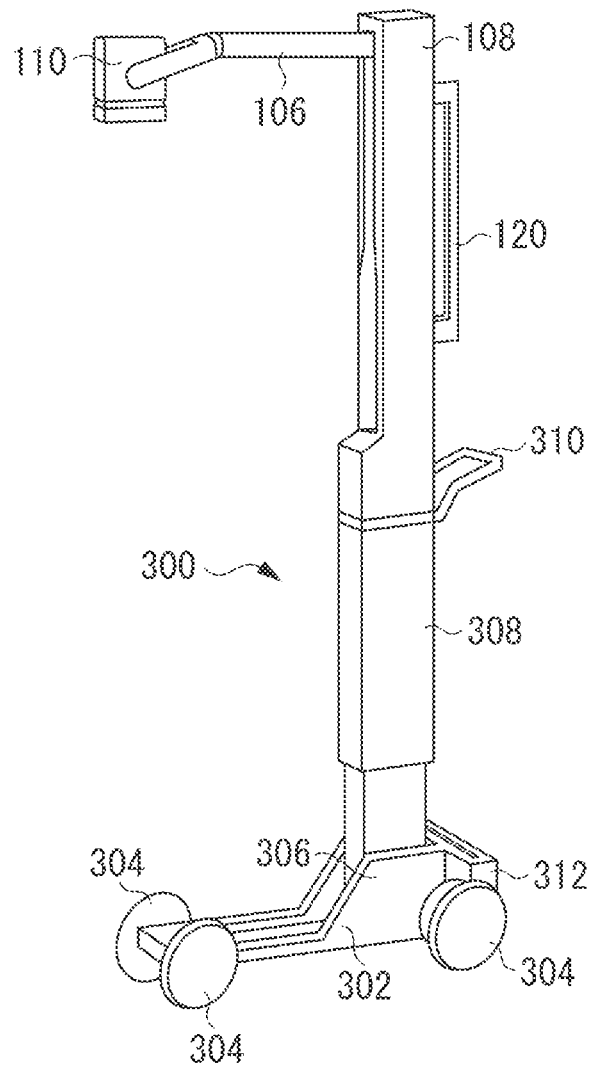


FIG. 5



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RADIATION GENERATING APPARATUS AND RADIATION IMAGING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a radiation generating apparatus including a support mechanism that supports a radiation generating unit configured to emit radiation, and a radiation imaging apparatus.

2. Description of the Related Art

Conventionally, a radiation generating apparatus is installed in an X-ray room in a hospital, for example, and used inside that room. Recently, a mobile radiation imaging apparatus that can be easily moved has also been developed, enabling radiation imaging to be carried out by moving the apparatus to a hospital room.

A mobile radiation imaging apparatus has a configuration in which an arm that supports a radiation generating unit and a support pillar that supports the arm by pinching the arm therein (see Japanese Patent Application Laid-Open No. 2007-144161).

However, since the mobile radiation imaging apparatus discussed in Japanese Patent Application Laid-Open No. 2007-144161 includes a cart in which the arm is pinched in the support pillar, transportability is poor. Consequently, there is a need for improvement of the radiation generating apparatus and the radiation imaging apparatus.

SUMMARY OF THE INVENTION

The present invention is directed to a radiation generating apparatus and a radiation imaging apparatus that have excellent transportability.

According to an aspect of the present invention, a radiation generating apparatus includes a radiation generating unit configured to generate radiation, an arm configured to support the radiation generating unit, and a support pillar configured to support the arm and rotate the arm, wherein the support pillar has a housing portion that has a space for housing at least a part of the radiation generating unit.

According to another aspect of the present invention, a radiation imaging apparatus includes the above-described radiation generating apparatus, a radiation detection apparatus configured to detect radiation that has passed through a subject, and a display device configured to display an image generated based on detected data.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an appearance of a radiation generating apparatus according to a first exemplary embodiment of the present invention.

FIG. 2 illustrates an operation form of a radiation generating apparatus according to the first exemplary embodiment of the present invention.

FIG. 3 illustrates a housing form of a radiation generating apparatus according to the first exemplary embodiment of the present invention.

FIGS. 4A and 4B illustrate an appearance of a radiation generating apparatus according to a second exemplary embodiment of the present invention.

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FIG. 5 illustrates an appearance of a radiation generating apparatus according to a third exemplary embodiment of the present invention.

DESCRIPTION OF THE EMBODIMENTS

Various exemplary embodiments, features, and aspects of the invention will be described in detail below with reference to the drawings. Further, unless stated otherwise, common or similar parts in the exemplary embodiments are denoted with the same reference numerals, and a duplicate description of such parts is omitted.

FIG. 1 illustrates an appearance of a radiation generating apparatus (radiation imaging apparatus) according to a first exemplary embodiment of the present invention. The radiation generating apparatus includes a support pedestal **112** installed on the floor, a support pillar **108** that stands erect in the vertical direction with respect to the support pedestal **112**, an arm **106** that is rotatably arranged with respect to the support pillar **108**, and a radiation generating unit **100** that is rotatably arranged with respect to the arm **106** and is configured to emit radiation. To make the radiation generating apparatus as compact as possible, a form in which the radiation generating apparatus does not include a display device for displaying images, is illustrated. Further, the support pillar **108** and the arm **106** can also be depicted as a support mechanism that supports the radiation generating unit **100** which generates radiation.

The radiation generating unit **100**, which is configured to generate radiation, includes, for example, a radiation tube that emit radiation and a diaphragm for controlling an irradiation area of the radiation. An aperture portion **102** is an unshielded aperture through which the radiation emitted from the radiation generating unit **100** can pass. Therefore, the aperture direction of the aperture portion **102** becomes the emission direction of the radiation.

The radiation generating unit **100** is a transmission type radiation generating unit. The transmission type radiation generating unit is provided with a radiation shielding member on the target electron incident side and the radiation emission side to shield unnecessary radiation. The transmission type radiation generating unit can be realized in a smaller, lighter configuration than a rotating anode type radiation generating unit, for example, because it is not necessary to cover the whole periphery of the radiation tube or the enclosure housing the radiation tube with a shielding material such as lead.

The arm **106** is an arm that links the radiation generating unit **100** and the support pillar **108**. The arm **106**, which supports the radiation generating unit **100**, has a predetermined length. Further, the arm **106** may include an extension/contraction mechanism for extending/contracting the arm **106** in a longitudinal direction, and a rotation mechanism for rotating the arm **106** with an articulated mechanism that can bend in various directions. By extending the arm **106** in a predetermined direction, the radiation generating unit **100** can be moved toward a subject side.

The arm **106** can be rotated about an upper end of the support pillar **108**. More specifically, the support pillar **108** has an arm hinge (not illustrated) for allowing the arm **106** to rotate in a predetermined rotating direction (direction A). For example, the support pillar **108** may have the arm hinge at the upper end of the support pillar **108**. The arm **106** has a rotating range of about 90° in the predetermined rotating direction (direction A). Thus, the arm hinge is a mechanism that couples the arm **106** and the support pillar **108**, and is capable of opening/closing the arm **106** with respect to the support

pillar **108**. When the arm **106** is folded, the arm **106** is in a substantially parallel state to the support pillar **108**.

Thus, by rotating the arm **106** in a predetermined direction (direction A) via the arm hinge, as illustrated in FIG. 1, the arm **106** can be changed from a form in which the arm **106** is extended in the horizontal direction to a form in which the arm **106** is housed with the radiation generating unit **100**. The expression “form in which the arm **106** is extended in the horizontal direction” refers to a state in which the radiation generating unit **100** is moved toward the subject side. The expression “form in which the arm **106** is housed with the radiation generating unit **100**” refers to a state in which the arm **106** is folded, and the arm **106** is substantially parallel to the support pillar **108**. In other words, it is a state in which the radiation generating unit **100** is arranged near the floor. Further, a specific example of the arm **106** being housed with the radiation generating unit **100** in the support pillar **108** will be described below.

Further, the radiation generating unit **100** is attached to the end of the arm **106**. An articulating mechanism **104** that is coupled with the radiation generating unit **100** and rotates the radiation generating unit **100** is provided at the end of the arm **106**. The articulating mechanism **104** enables the angle of the radiation generating unit **100** to be varied with respect to a plurality of rotational axes. A resistance derived from a hydraulic mechanism, for example, is applied to the articulating mechanism **104**. When the operator applies a certain level of force thereto, the angle of the radiation generating unit **100** changes. Accordingly, the operator can change the angle of the radiation generating unit **100** without wobbling.

As illustrated in FIG. 1, the articulating mechanism **104** enables the radiation generating unit **100** to be moved from side to side and up and down when the arm **106** is in a horizontal state, so that the position of the radiation generating unit **100** can be adjusted when imaging.

More specifically, when the arm **106** is in a horizontal state, the articulating mechanism **104** can rotate the radiation generating unit **100** in a predetermined direction (direction B) about the longitudinal direction of the arm **106**. Further, the articulating mechanism **104** can also rotate the radiation generating unit **100** in a predetermined direction (direction C) about the direction that is orthogonal to the longitudinal direction of the arm **106**. Thus, the radiation generating unit **100** can be rotated about a plurality of rotational axes by the articulating mechanism **104**.

The radiation generating apparatus includes a support pedestal **112** for supporting the support pillar **108**. The support pedestal **112** can be detached from the support pillar **108**. If performing radiation imaging at a home healthcare location, for example, the support pedestal **112** can be used by, for example, inserting under a bed. This is a type of usage suitable when utilizing the radiation generating apparatus according to the present exemplary embodiment for radiation imaging performed at a relatively low position.

The support pedestal **112** has a U shape or the like. The support pedestal **112** enables the balance of the radiation generating apparatus to be maintained even when the support pedestal **112** is not arranged directly below (the lower side in the vertical direction) the radiation generating unit **100**. The radiation detection apparatus is arranged directly below (the lower side in the vertical direction) the radiation generating unit **100**. Thus, the radiation detection apparatus can be arranged in an area where the support pedestal **112** is not arranged.

The support pedestal **112** may have a plurality of split leg portions. The plurality of leg portions are each in contact with the floor (or a bed). The plurality of leg portions are arranged

to be placed on the floor so as to maintain the balance of the radiation generating apparatus. The support pedestal **112** can be formed in a U shape or the like by changing the shape of the plurality of leg portions. When imaging, as illustrated in FIG. 1, the support pedestal **112** has a U shape or the like. The support pedestal **112** may also include a plurality of articulated portions so that the plurality of leg portions configuring the support pedestal **112** can be folded.

Further, although an example was illustrated in which the support pedestal **112** has a plurality of leg portions, a form in which the support pedestal **112** formed with a single member is bent in a curved shape is also included in the concept of a plurality of leg portions. Further, the plurality of leg portions of the support pedestal **112** may also be configured with, for example, a collection of rod members, a collection of cylindrical members, or a collection of linear members (a mesh structure). In other words, the plurality of leg portions of the support pedestal **112** can be applied in forms like those described above as long as they support the support mechanism (support pillar **108**) supporting the radiation generating unit that emits radiation.

The support pillar **108** includes a housing portion **110** that has a space for housing the radiation generating unit **100** in the body of the support pillar **108**, and an arm housing portion **114** that has a space for housing the arm **106**. The arm housing portion **114** can house the articulating mechanism **104** together with the arm **106**.

The housing portion **110** housing the radiation generating unit **100** and the arm housing portion **114** are formed in the support pillar **108** so as to cut into the body of the support pillar **108**. Thus, the housing portion **110** and the arm housing portion **114** are groove portions having a vertical and horizontal length and a depth sufficient to allow the radiation generating unit **100** and the arm **106** to be housed. These groove portions are formed along the longitudinal direction (vertical direction) of the support pillar **108**. Further, an arm hinge for allowing the arm **106** to be rotated is arranged in the groove portion. The housing portion **110** has a space for housing at least a part of the radiation generating unit **100**. The housing portion **110** may have a space for housing whole of the radiation generating unit **100**. The arm housing portion **114** has a space for housing at least a part of the arm **106**. The housing portion **110** may have a space for housing whole of the arm **106**.

The housing portion **110** housing the radiation generating unit **100** and the arm housing portion **114** are configured with a radiation shielding member such as lead that can shields the radiation emitted from the radiation generating unit **100**. For example, a radiation shielding member is attached to the inner faces (groove portions) of the housing portion **110** and the arm housing portion **114**.

To reduce weight, the housing portion **110** and the arm housing portion **114** may also be formed with different radiation shielding members. For example, a tungsten sheet may be attached on the inner face (groove portion) of the arm housing portion **114**, and a lead panel may be attached on the inner face (groove portion) of the housing portion **110**. Consequently, if the radiation generating unit **100** is housed in the housing portion **110**, the leakage of radiation from the radiation generating unit **100** can be prevented by the radiation shielding member.

If the radiation generating unit **100** is housed in the housing portion **110** that is formed in the support pillar **108**, as illustrated in FIG. 1, the operator rotates the radiation generating unit **100** in direction B and direction C via the articulating mechanism **104**. In other words, when the operator folds the

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arm 106, the radiation generating unit 100 rotates the radiation generating unit 100 to be housed in the housing portion 110.

FIG. 2 illustrates an operation form of a radiation generating apparatus. The form illustrated in FIG. 2 occurs when the operator rotates the arm 106 via the arm hinge in order to rotate the arm 106 in a predetermined direction (direction A). When the arm 106 is further rotated to the support pillar 108 side, the operator checks whether the radiation generating unit 100 has been housed in the housing portion 110. When the arm 106 is further rotated to the support pillar 108 side, if the radiation generating unit 100 is housed in the housing portion 110 (i.e., in a state in which the radiation generating unit 100 does not protrude from the housing portion 110), the operator further rotates the arm 106 to the support pillar 108 side. If the radiation generating unit 100 is not housed in the housing portion 110 (i.e., in a state in which the radiation generating unit 100 protrudes from the housing portion 110), the operator adjusts the position by rotating the radiation generating unit 100 in direction B and direction C via the articulating mechanism 104 so that the radiation generating unit 100 is housed in the housing portion 110 (i.e., in a state in which the radiation generating unit 100 does not protrude from the housing portion 110). Then, the operator rotates the arm 106 to the support pillar 108 side.

FIG. 3 illustrates a housing form of a radiation generating apparatus. The operator folds the arm 106 so that the arm 106 is substantially parallel to the support pillar 108. In this state, the radiation generating unit 100 is arranged near the floor. At this stage, the radiation generating unit 100 is housed in the housing portion 110, and the arm 106 is housed in the arm housing portion 114. When the radiation generating unit 100 and the arm 106 have been housed, the radiation generating unit 100 and the arm 106 are integral with the support pillar 108.

The housing portion 110 of the support pillar 108 includes a lock mechanism that locks rotation of the radiation generating unit 100 when the radiation generating unit 100 is housed in the housing portion 110 of the support pillar 108. The lock mechanism is a mechanism for locking rotation of the radiation generating unit 100 when the aperture portion 102, which determines the emission direction of the radiation, is aligned with the shaft direction of the support pillar 108. More specifically, the lock mechanism locks the arm hinge portion for rotating the arm 106 in direction A and the articulating mechanism 104 for rotating the radiation generating unit 100 in direction B and direction C.

With the lock mechanism, when housing the radiation generating unit 100 in the housing portion 110, the radiation generating unit 100 is housed with the aperture portion 102 fixed facing the support pillar 108. The housing direction of the radiation generating unit 100 is the direction in which the aperture portion 102, which determines the emission direction of the radiation, is hidden from the portion facing the external air. The aperture portion 102, which determines the emission direction of the radiation, is made to face the radiation shielding member provided in the housing portion 110 of the support pillar 108. Therefore, the radiation emitted from the radiation generating unit 100 can be shielded. As a result, if the radiation generating unit 100 is housed in the housing portion 110, the operator can be protected from radiation leakage by the radiation shielding member, so that safety can be maintained.

Further, as another housing form, the lock in the direction of the aperture portion 102 may be set in the floor direction of the support pillar 108 during the period from housing of the radiation generating unit 100 until rotation of the arm 106. In

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this case, the aperture portion 102 of the radiation generating unit 100 always faces the floor direction when the support pillar 108 is erect, so that the aperture portion 102 can be prevented from facing the operator who is standing by the apparatus during the period from housing until rotation of the arm 106.

In addition, the support pillar 108 may have a handle (not illustrated) for the operator to grasp when carrying the radiation generating apparatus. For example, the handle may be provided near the middle of the support pillar 108. The operator can carry the radiation generating apparatus by grasping the handle and lifting it up.

A power supply unit (not illustrated) for supplying power to the radiation generating unit 100 may also be provided in the support pillar 108. More specifically, the power supply unit is provided at the lower end of the support pillar 108, and is integrated with the support pillar 108. The power supply unit is provided on the opposite side (the rear side in FIG. 1) of the side on which the radiation generating unit 100 is arranged (the front side in FIG. 1). The power supply unit is provided on a side face of the support pillar 108 so as not to be interfered with by the arm 106 or the radiation generating unit 100 when the arm 106 is folded.

Further, when the arm 106 is folded and the arm 106 has been housed with the radiation generating unit 100, the radiation generating unit 100 and the power supply unit are each arranged on the side near the floor. Since the radiation generating unit 100 and the power supply unit, which are comparatively heavy, are positioned near the floor, the operator can stably carry the radiation generating apparatus using the handle.

The support pillar 108 has a separation mechanism (not illustrated) for separating the support pillar 108 from the support pedestal 112. The operator can detach the support pillar 108 from the support pedestal 112. Therefore, the operator can carry the radiation generating apparatus by separating the support pedestal 112 from the other constituent parts (the radiation generating unit 100, the arm 106, the support pillar 108, and the power supply unit).

As illustrated in FIGS. 4A and 4B, the radiation generating apparatus other than the support pedestal 112 that is separated therefrom includes at least the radiation generating unit 100, the arm 106, the support pillar 108, and the power supply unit. When imaging, although the operator needs to move the radiation generating unit 100 according to the imaging site of the subject, the operator does not need to move the power supply unit. Therefore, as described above, the radiation generating unit 100 is arranged on the arm 106, and the power supply unit is arranged on the support pedestal 112. Thus, the radiation generating unit 100 and the power supply unit are each arranged on different constituent parts.

According to the present exemplary embodiment, the radiation generating apparatus includes the radiation generating unit 100 that generates radiation, the arm 106 that supports the radiation generating unit 100, and the support pillar 108 that supports the arm 106 to rotate the arm 106, and the support pillar 108 has a housing portion 110 that has a space for housing at least a part of the radiation generating unit 100. Further, the radiation imaging apparatus includes the radiation generating apparatus, a radiation detection apparatus configured to detect radiation that has passed through a subject, and a display device that displays an image based on the detected data.

In other words, the radiation generating apparatus includes the radiation generating unit 100 that generates radiation, the arm 106 that supports the radiation generating unit 100, and the support pillar 108 that supports the arm 106 at a predeter-

mined height from the floor. The support pillar **108** has a hollow portion. The arm **106** can be rotated about the upper end of the support pillar **108**, and be housed with the radiation generating unit **100** in the hollow portion of the support pillar **108**.

Therefore, the radiation generating apparatus according to the present exemplary embodiment has an excellent accommodability, and has excellent transportability. Thus, the operator can easily transport the radiation generating apparatus and the radiation imaging apparatus. Further, by detaching the support pedestal **112**, these apparatuses can be easily transported and mounted in a vehicle. The apparatuses can be quickly ready for a radiation imaging form simply by attaching the support pedestal **112** to the support pillar **108**. Further, since the aperture portion **102** of the radiation generating unit **100** is housed in the support pillar **108** that is formed with a radiation shielding member, radiation leakage can be prevented.

Further, in the present exemplary embodiment, the support pillar **108** includes, in the body of the support pillar **108**, the housing portion **110** that has a space for housing the radiation generating unit **100**, and the arm housing portion **114** that has a space for housing the arm **106**. However, the support pillar **108** may have only the housing portion **110** that has the space for housing the radiation generating unit **100** in the body of the support pillar **108**.

Next, a second exemplary embodiment will be described. FIGS. **4A** and **4B** illustrate an appearance of a radiation generating apparatus according to the second exemplary embodiment of the present invention. The difference from the first exemplary embodiment is that the radiation generating apparatus has a cover **200** for covering the radiation generating unit **100** housed in the housing portion **110**.

FIG. **4A** illustrates a state before the cover **200** is mounted on the support pillar **108**, and FIG. **4B** illustrates a state after the cover **200** has been mounted on the support pillar **108**. The cover **200**, which is configured so as to be engageable with the support pillar **108**, can cover the radiation generating unit **100** housed in the housing portion **110**. The shape of the cover **200** is defined so that the radiation generating apparatus attached to the cover **200** on the support pillar **108** is substantially a quadrangular prism.

The cover **200** is configured using a radiation shielding member such as lead that can shield the radiation emitted from the radiation generating unit **100**. For example, a radiation shielding member is attached to the inner face (radiation generating unit **100** side) of the cover **200**.

The operator houses the radiation generating unit **100** in the housing portion **110** and covers the radiation generating unit **100** with the cover **200**. Consequently, the operator can be better protected from radiation leaks from the radiation generating unit **100** by the radiation shielding member of the support pillar **108** and the radiation shielding member of the cover **200**.

More specifically, as illustrated in FIG. **4A**, the cover **200** has a plurality of convex portions **202** and **204**. Further, the support pillar **108** has a plurality of concave portions **150**, **152**, **154**, and **156** at positions corresponding to the plurality of convex portions **202** and **204**. The convex portion **202** provided in the cover **200** is inserted into the concave portions **150** and **152** provided in the support pillar **108**. The convex portion **204** provided in the cover **200** is inserted into the concave portions **154** and **156** provided in the support pillar **108**. The plurality of convex portions **202** and **204** are inserted in the same manner in the concave portions **150**, **152**, **154**, and

156, so that the cover **200** is engaged with the support pillar **108**. This enables the cover **200** to be mounted on the support pillar **108**.

In the above description, although the cover **200** covering the support pillar **108** using a plurality of convex portions **202** and **204** and concave portions **150**, **152**, **154**, and **156** is described, the cover **200** may be changed, as long as the cover **200** covers the radiation generating unit **100** housed in the housing portion **110**. For example, a configuration in which a groove is provided in the longitudinal direction of the support pillar **108**, and the cover **200** is attached to the support pillar **108** by sliding the cover **200** covering the radiation generating unit **100** housed in the housing portion **110** along the groove provided in the support pillar **108**, may be employed. Further, the cover **200** covering the radiation generating unit **100** housed in the housing portion **110** may be arranged on the support pillar **108** using a hinge.

As illustrated in FIG. **4B**, when the cover **200** is attached to the support pillar **108**, the radiation generating apparatus is substantially a quadrangular prism, which is suitable for transporting the radiation generating apparatus. Therefore, the operator can transport the radiation generating apparatus easily and safely.

Further, when the operator is transporting the radiation generating apparatus, a configuration with better protection can be obtained by housing the support pillar **108** in which the arm **106** and the radiation generating unit **100** are housed in a case (not illustrated). This case (not illustrated) may be a hard case or a soft case.

Next, a third embodiment will be described. FIG. **5** illustrates an appearance of a radiation generating apparatus according to a third exemplary embodiment of the present invention. The difference from the first and second exemplary embodiments is that the radiation generating apparatus has a movable portion that can move the radiation generating apparatus along the floor.

FIG. **5** illustrates a case in which, in the radiation generating apparatus according to the present invention, the support pedestal **112** illustrated in FIG. **1** has been detached, and a movable portion **300** for moving along the floor is attached. Description of the parts including the radiation generating unit **100** and the support pillar **108** will be omitted here, as it is similar to that in FIG. **1**. A form in which the radiation generating apparatus is mounted on the movable portion **300** is suitable for imaging by moving the radiation generating apparatus to a hospital room. The radiation generating unit **100** can be brought closer to the affected area of the subject by placing the anterior portion of the movable portion **300** beneath the bed.

FIG. **5** illustrates a form of a support pedestal that allows the radiation generating apparatus to move. The support pedestal and the radiation generating unit **100** configures the movable portion **300** capable of moving along the floor. More specifically, the movable portion **300** has wheels **304** that roll along the floor. The wheels **304** are a plurality of tires or casters that are always touching the floor. By rolling the wheels **304**, the movable portion **300** (the radiation generating apparatus) can be moved in forward and backward directions.

The movable portion **300** has a support portion **308** for supporting the support pillar **108**. While imaging, the support portion **308** is erected in the vertical direction. The support portion **308**, which has a predetermined length, includes an extension/contraction mechanism for extending/contracting the support portion **308** in a longitudinal direction. The support portion **308** may also have a lock portion (not illustrated) for fixing the extension/contraction of the extension/contraction

tion mechanism. The support portion **308** can be extended/contracted by releasing the fix on extension/contraction by the lock portion.

Further, the movable portion **300** has a rotation mechanism **306** that rotates the support portion **308**. The support portion **308** can be tilted forward by the rotation mechanism **306**. By rotating the support portion **308**, the support portion **308** can be made parallel to the floor. By housing the support portion **308**, the movable portion **300** can be made compact.

A support member **302** is a constituent part that supports the radiation generating apparatus. As illustrated in FIG. 5, the constituent parts in the radiation generating apparatus that are in contact with the floor are the plurality of wheels **304**. The support member **302** of the movable portion **300** rotatably supports the plurality of wheels **304**. Further, the radiation generating apparatus is supported by the wheels **304** and the support member **302** of the movable portion **300**. The area in contact with the floor of the radiation generating apparatus can be widened by the support member **302**. Therefore, for example, the balance of the radiation generating apparatus can be maintained by the support member **302** even when the radiation generating unit **100** is positioned at an imaging site of the subject.

The support portion **308** has a coupling portion (not illustrated) for detachably coupling thereof with the support pillar **108**. More specifically, the upper end of the support portion **308** has a coupling portion that couples with the support pillar **108**. The coupling portion is a member that protrudes upwards from the upper end. The support pillar **108** is hollow. As illustrated in the FIG. 5, the movable portion **300** couples with the support pillar **108** by fitting the upwards-protruding coupling portion inside the support pillar **108**.

A handle **310** for the operator to grasp is included on the support portion **308**. This handle **310** is used as a position to hold when moving or transporting. The handle **310** can also be used as a tray on which a laptop computer or a tablet computer can be mounted for controlling radiation irradiation by the radiation generating unit **100** during imaging.

The movable portion **300** may include a holder **312** for housing the radiation detection apparatus. The radiation detection apparatus is a flat panel detector. More specifically, the holder **312** housing the radiation detection apparatus is arranged on the support member **302**. The holder **312** is arranged on the opposite side (the rear side in FIG. 5) of the side on which the radiation generating unit **100** is arranged (the front side in FIG. 5). The holder **312** is arranged on a side face of the support member **302** so as not to be interfered with by the arm **106** or the radiation generating unit **100** when the arm **106** is folded. Further, the radiation detection apparatus includes relatively heavy constituent parts. The balance of the radiation generating apparatus can be stabilized by housing the radiation generating apparatus in the holder **312** arranged on the end of the support member **302** (the side close to the floor).

The support pillar **108** has a handle **120** for the operator to grasp when transporting the radiation generating apparatus. By grasping the handle **120** and lifting it up, the operator can separate the radiation generating apparatus from the movable portion **300**, and carry the radiation generating apparatus around.

According to the present exemplary embodiment, the radiation generating apparatus can be moved with the radiation generating unit **100** and the support pillar **108** housed in the support pillar **108**. Therefore, the risk of the radiation generating unit **100** and the arm **106** coming into contact with obstructions when moving can be reduced. Further, even at the imaging location, the radiation generating apparatus can

be quickly readied for a radiation imaging mode simply by raising the radiation generating unit **100** and the arm **106** from the support pillar **108**.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2013-189448 filed Sep. 12, 2013, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. A radiation generating apparatus comprising:

a radiation generating unit configured to generate radiation;
an arm configured to support the radiation generating unit;
and
a support pillar configured to support the arm and rotate the arm,

wherein the support pillar comprises a housing portion that has a space for housing at least a part of the radiation generating unit.

2. The radiation generating apparatus according to claim 1, wherein the support pillar comprises an arm housing portion that has a space for housing at least a part of the arm.

3. The radiation generating apparatus according to claim 1, wherein the arm is configured to rotate around an upper end of the support pillar.

4. The radiation generating apparatus according to claim 1, wherein the support pillar comprises a radiation shielding member.

5. The radiation generating apparatus according to claim 4, wherein the radiation shielding member is any one of a lead panel and a tungsten sheet.

6. The radiation generating apparatus according to claim 1, wherein the housing portion comprises a radiation shielding member covering an inner face of the housing portion.

7. The radiation generating apparatus according to claim 1, wherein the radiation generating unit comprises an aperture portion, and

wherein, in a state in which the aperture portion of the radiation generating unit is facing the support pillar, the radiation generating unit is housed in the housing portion.

8. The radiation generating apparatus according to claim 1, wherein the radiation generating unit comprises an aperture portion, and

wherein, in a state in which the aperture portion of the radiation generating unit is facing in a floor direction, the radiation generating unit is housed in the housing portion.

9. The radiation generating apparatus according to claim 1, further comprising a support pedestal configured to support the support pillar, wherein the support pedestal is detachable from the support pillar.

10. The radiation generating apparatus according to claim 1, further comprising a lock mechanism configured to lock rotation of the radiation generating unit when the radiation generating unit is housed in the housing portion.

11. The radiation generating apparatus according to claim 1, further comprising a cover configured to cover the radiation generating unit housed in the housing portion.

12. The radiation generating apparatus according to claim 1, further comprising a movable portion configured to move along a floor with the radiation generating unit.